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DEPARTMENT OF SOCIAL SCIENCES

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Anthropic action on the vegetation in the Western Ghats of India (Shimoga District, Karnataka): A study using agrarian systems analysis

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The aim of this paper is to analyse ways in which the environment is utilised by village communities, according to the type of vegetation and the overall social factors which generate a particular form of appropriation of territory.

Following a historical survey of the impact of human activity within our area of study, an analysis of agrarian systems will enable us to identify differing situations and define some homogenous types. The consistencies and contradictions within each system will then be discussed in the course of a detailed investigation into the dynamics of some village communities.

SCIENTIFIC BACKGROUND

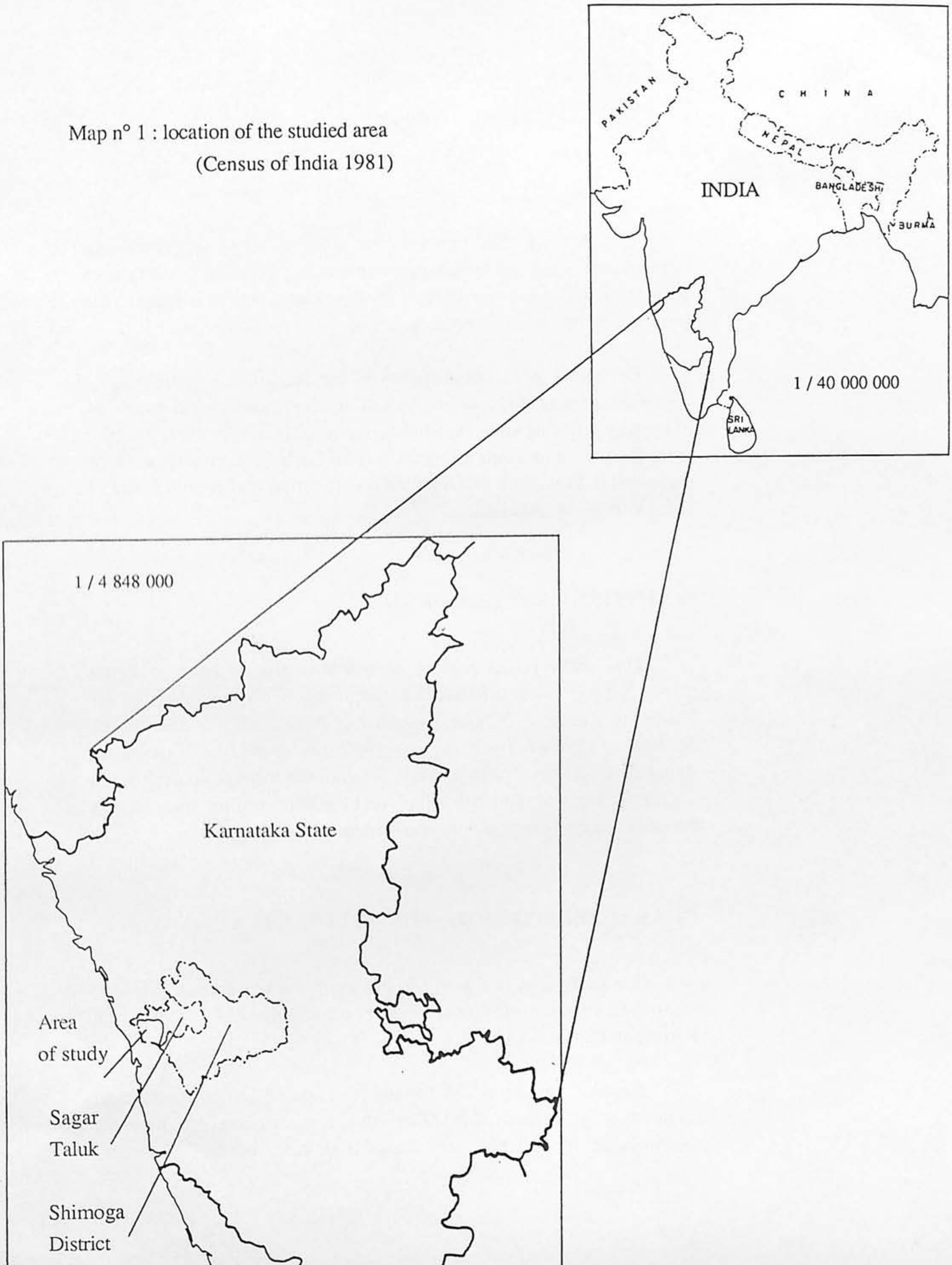
This study forms part of an interdisciplinary environmental research programme affiliated to the French National Centre for Scientific Research (CNRS), which has been started at the French Institute of Pondicherry in January 1992. Under the title "Ecosystem dynamics and social change", this programme aims at analysing the social, ecological and historical factors determining interactions between human beings and their environments.

CHARACTERISTICS OF THE STUDY AREA

Our study area is situated in the southwestern part of Shimoga District (Karnataka), in Sagar taluk, bordering the districts of North Kanara and South Kanara (see map no. 1).

Bounded on the east by the artificial lake of Linganamakki and on the west by the ridge of the Ghats, this small insulated area includes examples of very diverse landscapes. It is surrounded by evergreen

Map n° 1 : location of the studied area
(Census of India 1981)



forest and its vegetation includes every stage of degradation of the climax forest (map no. 2). The hills and valleys bear a real mosaic of forest, grassland (with varying shrub-coverage), plantations (of acacia, casuarina and pines), and cultivated areas (rice fields and areca orchards).

At this altitude the forest which follows the crest of the Ghats is a *Dipterocarpus indicus*, *Diospyros candolleana* and *Diospyros oocarpa* type (Pascal 1982). A short distance east of the lake lies deciduous forest in its various stages of degradation. Beyond that are the great rice-bearing plains which mark the beginning of the Deccan plateau.

This region lies in the heart of the malnads or wet hill country, and receives a considerable amount of monsoon rainfall from the beginning of June until the end of September, with a strong west-east gradient: 7,200 mm at Kogar on the peak of the Ghats, 3,100 mm at Araballi beside the lake. But this gradient of rainfall, diminishing from west to east, does not affect the distribution of vegetation in the study area; the totals are sufficient to support evergreen forest throughout it (the minimum limit being 2,000 mm per year).

The hills are very steep near the crest of the Ghats, and become less precipitous as one moves eastwards.

Communication routes are restricted to two main axes:

- going east, the main road ends at the lake, which can be crossed by ferry.
- to the north, at Kogar, the road joins the Bhatkal-Jog Falls highway.

The other roads are not tarred, and thus not practicable for heavy vehicles during the rainy season.

Agriculture is confined to the valleys. During the monsoon, rice, sugar cane and areca orchards with bananas, pepper, cardamom, coffee and cocoa occupy the cultivated area. In the dry season, fields which cannot be used for rice at that time produce vegetables for home consumption (green peppers, peas, finger millets, chillies ...).

Various human actions which have shaped this landscape can be immediately identified. In the past there has been intensive logging by the Forest Department and many private timber merchants under contract to the foresters. At present, the vegetation dynamics is characterised by four main factors:

Map n°2 : legend

▧ Disturbed climax of evergreen to semi-evergreen forest

▥ Disturbed secondary stage of evergreen and semi-evergreen forest

▩ Thicket (degraded stage of evergreen and semi-evergreen forest)

▤ Dense forest (secondary moist deciduous forest)

▨ Woodland to savanna woodland (secondary moist deciduous forest)

░ Tree savanna to grass savanna (degraded stage of evergreen and semi-evergreen forest)

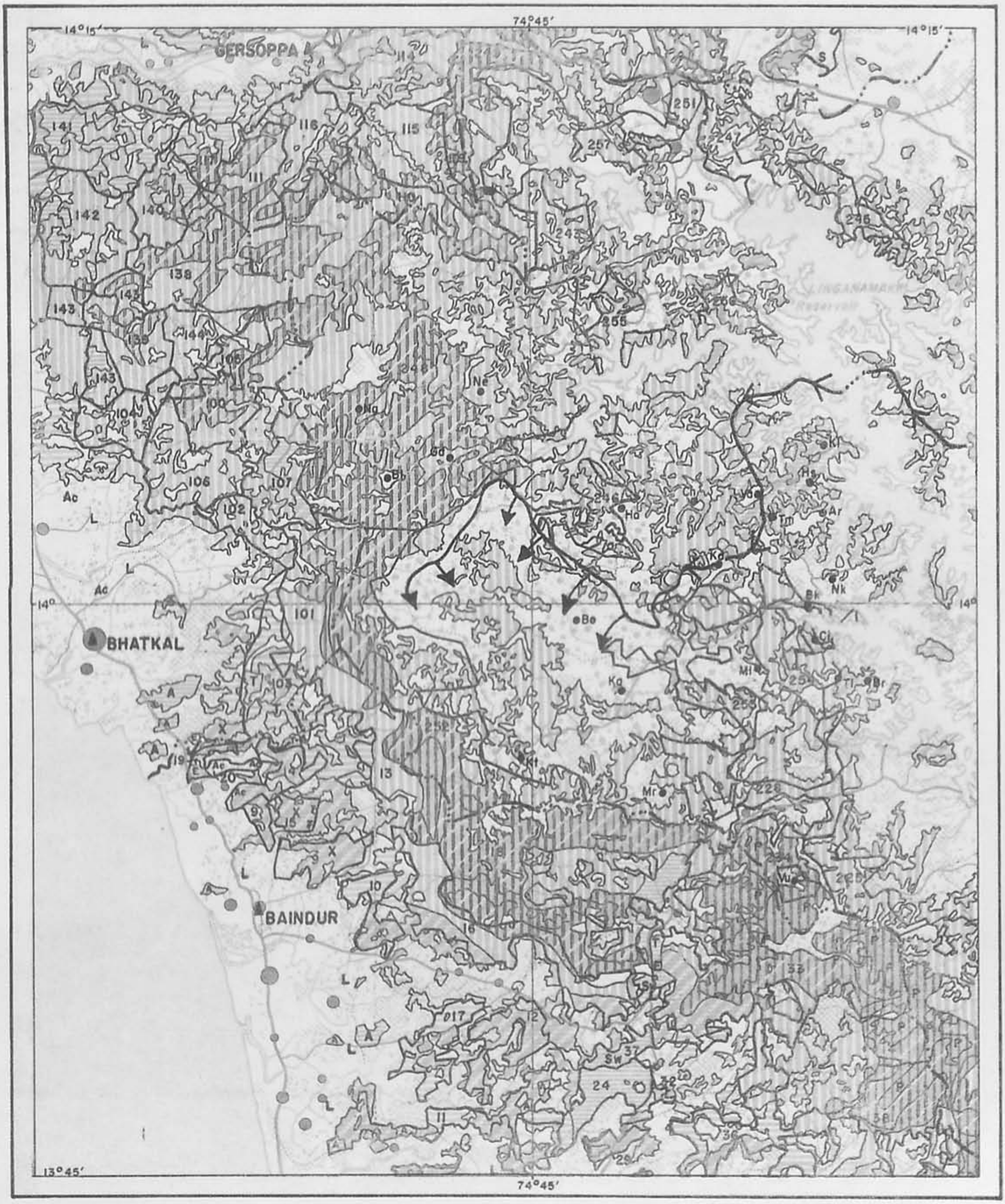
□ Cultivated land

→ : access between 1940 and 1960

Ng. : Nagavalli
Ne. : Nelahari
Gd. : Gudihitlu
Bl. : Balige
Kr. : Karni
Bo. : Bobigge
Ka. : Kodanalli
Mr. : Marathi

Vu. : Valur
Ch. : Chaduravalli
Kd. : Kudrur
Ml. : Malur
Va. : Valagere
Kl. : Kalasavalli
Hs. : Hosahalli
Tm. : Tumri

Ar. : Araballi
Nk. : Nadakeppige
Bk. : Brahmanakeppige
Ci. : Chimale
Tl. : Talagodu
Br. : Baruve
Ha. : Hadagalale



Map n° 2 : vegetation of the studied area (PASCAL 1982)
scale : 1 / 250000

- all shrubby and treed grasslands are burnt off at least once a year (in January-February and/or April-May), which prevents any forest regeneration.
- plantation by the Forest Department and by the Mysore Paper Mill (Shimoga) increases in extent every year and occupies as much as 20% of the land area in certain villages.
- overgrazing is increasing as grazing-lands diminish, being taken over by new plantations.
- materials are removed by local villagers from the various types of vegetation areas.

THE IMPACT OF PAST HISTORY

Historical antecedents go far towards explaining current social behaviour as well as helping us to understand the series of human actions which have brought about changes in the natural environment.

Forest management

During the 18th century Shimoga District formed part of the kingdom of Tippu Sultan. In 1799, after Tippu's defeat by the British, Shimoga came under the control of the hindu Maharajas of Mysore. At the time this princely state was under British administration, and a Forest Department was created in 1864.

The taluk of Sagar was part of Nuggur division, and came under the Conservator of Forests of the Madras Presidency (STEBBING 1921). But although British forest management was applied to Shimoga in theory, in practice this district was never so strictly managed as, for example, North Kanara.

During the 19th century, when large areas of Shimoga district were already cultivated, it seems that conflicts between cultivators and forest staff were usually settled amicably. But such was not really the case for the region which concerns us, where environmental conditions were comparable to those in North Kanara (POUCHEPADASS 1990). As we shall see, the influence of North Kanara and its agricultural and forest practices was felt most in the western part of Sagar taluk, in the Ghats; this applies especially to bettalands, which were officially recognised in the 19th century in North Kanara, but not in Shimoga.

In Shimoga District, and in our study area in particular, open conflicts between the Forest Department and the villagers emerged by the beginning of the 20th century.

In 1801, BUCHANAN described the Ghats region northwest of "Hyder-Nagar" (Hossanagar) as follows :

"...the road then passes through a forest which spontaneously produces black pepper. The trees cover all this hilly region. A small rivulet descends from the hills, and waters a narrow valley, which in the bottom is cultivated with rice, and on the side is planted with Betel and coconut palms..."

Fifty years later, in 1857, Cleghorn observed a "huge destruction of the forest in the Ghats because of shifting cultivation" (CLEGHORN in STEBBING 1921). As a result, shifting cultivation was prohibited as soon as the Forest Department was established, leading to incidents between cultivators and forest staff in the area of our study. For Brandis, this was a necessary evil:

..."I am glad to observe that you have determined to apply some of the surplus obtained to placing the department on an efficient footing. It is at all times important not to obstruct measures of conservancy by withholding the means of efficient administration, and it is, as you say, very desirable to seize the opportunity of promoting systematic forest management in Native States"...

In 1881, the young Maharaja of Mysore was invested with full powers, and Stebbing hints that traditional practices were resumed in the princely state. This was the case for shifting cultivation.

Because of the difficulty of access to it, it may be presumed that the western part of our study area was protected from exploitation until a relatively late date. Moreover, felling of evergreen species started only at the beginning of this century (BUCHY 1990). In 1910-11 the Govardhangiri State Forest, created in 1908, was logged little if at all, because of access problems ("Past system of management" in WORKING PLAN 1977). But this was not true of the lower hills in the centre and east of our study-area. Actually we have very little precise information about forest management in this region before the beginning of the 20th century.

During the 1920s *Artocarpus hirsutus*, *Dipterocarpus indicus*, *Calophyllum polyanthum*, *Poecilineuron indicum*, *Santalum album* and

Dalbergia latifolia gained market value and were the main species felled.

From the 1950s onwards *Terminalia tomentosa, Lagerstroemia microcarpa, Terminalia paniculata, Syzygium cumini, Bombax ceiba, Holigarna beddomei, Mangifera indica, Mesua ferrea* and *Canarium strictum* also began to be logged.

In 1988 tree felling was suspended in the state of Karnataka. Over the last five years, therefore, it may be considered that human impact on the vegetation of this area is due essentially to the activities of local people.

The 20th century: the impact of hydro-electric dams

In 1930 studies for a dam project were undertaken and the areas to be flooded were delimited. The "M.G. Hydro-Electric Project" was inaugurated on February 5, 1939 : 139 villages were submerged and 20,000 people lost their land (source: records of the Karnataka Electricity Board).

In 1964, the "Sharavaty Valley Hydro-Electric Project" entailed the construction of a huge complex consisting of one main dam (Linganamakki) and three satellite reservoirs.

Situated near Khargal, far downstream from the earlier dam, Linganamakki submerged 154 villages and more than 15,000 people lost their land. In all, 11,600 hectares of cultivated land were flooded. The lake has an area of 362 km^2 and supplies 70% of Karnataka's electricity.

The construction of these dams had an immense impact on our study area. First of all, in 1930 and again in 1955-60, many of the people rendered homeless were compensated with grants of land around the shores of the lake. Field investigations enabled us to estimate that 20% of the present population of our study area had to move because of the lake. In addition, the two construction sites led to a large influx of workers. The population of Jog Falls, for instance, increased from 10,000 inhabitants in 1950 to more than 40,000 in 1961. Almost 25% of the present inhabitants of the area settled there in the years 1930 or 1950.

It can thus be stated that, in terms of migratory flow, the dams led to an almost 100% increase in the population of this area, and that this took place in two successive waves, causing:

- an increase in biomass requirements
- clearing of plots for cultivation

But the point which seems to have been most significant in terms of human impact on the vegetation was the utilisation of the areas of forest due to be submerged. Investigations being carried out amongst private timber merchants who bought concessions from the Forest Department in the 1930s and especially in the 1950s are confirmed by local old people: at that time private timber merchants from Kerala, Mysore, Bangalore or Shimoga felled far beyond the limits of the concessions granted to them, not hesitating to clear-cut entire hillsides for timber or charcoal-burning. In addition, the road network set up in 1930-40 (a tar road passing over the first dam and leading into the very heart of our area) made possible the removal of enormous quantities of logs and charcoal by the Forest Department and by private contractors. This road, which was built at the same time as the first dam, was a springboard which made massive cutting possible during the confusion which prevailed at the end of the fifties. It is said that a narrow belt of forest was left standing alongside the lake to mask the hidden activites taking place further west (map no. 2). On a larger scale, this "facade" phenomenon can also be found along the margins of forests, where no trees are cut for a depth of about fifty metres.

If the original vegetation of this area has escaped total destruction since the inundation of the Linganamakki lake , it is precisely because this "wood route" was disrupted when the earlier dam was submerged (1964). Once again the region became an isolated enclave, cut off between the lake and the ridge of the Ghats.

AGRARIAN SYSTEMS

In order to assess the extent of human impact on the environment, we found it necessary to make a detailed study of the agriculture of the area, identifying the various agrarian systems present and the various parameters regulating modes of biomass removal within each system.

Methodology

Let us recall that an agrarian system is "a historically constituted and long-lasting way of exploiting the surroundings. It is a system of production that is adapted to the bioclimatic conditions of a given area and corresponds to the conditions and social needs of the time." (M. MAZOYER in BEDU et al., 1987)

The systems approach proposes a representational model of the workings of a rural society (JOUVE 1984). This model makes it possible to show the internal cohesion of each system by emphasising the stable relationships existing between its various elements. Nevertheless a whole dimension of reality is left out of this organised and consistent framework: while certain practices combine to ensure the cohesion of the system, others, on the contrary, contradict it and constantly tend to work against this cohesiveness to destabilise the system.

An agrarian system is not something extraneous to a rural society: **it represents the way in which the local people make use of their environment to achieve aims they have set for themselves.**

We must therefore identify the various ways in which the environment gets used, and bring to light the social characteristics underlying the appropriation of space.

Table 1 shows the steps followed in analysing agrarian systems (JOUVE 1988):

Table 1: Methodology

CHOICE OF STUDY AREA

Depends on: the problem under consideration, information available about the overall ecological conditions of the region, and the regional context.

AGRO-ECOLOGICAL ZONING

Enables: definition of the principal agro-ecological units (AEUs), investigation of recent changes in agricultural practices and their repercussions.

CHOICE OF A LIMITED NUMBER OF SYSTEMS OF AGRICULTURAL PRODUCTION (SAPs)

By: research into as many different modes of use as possible, in cultivation and animal-husbandry; study of local production structures.

FUNCTIONAL ANALYSIS OF THE DIFFERENT SAPs

Through: listing of methods of production; the recent history of production systems; the logic underlying choices of cultivation techniques in the course of the cycle; analysis of the cultivator's plans.

TYPOLOGY OF SAPs

Categorised by: *overall strategy of the farmers; their aims and economic opportunities.*

QUALITATIVE MODEL OF THE DEVELOPMENT OF SAPs

By examining: frequency of the SAPs; relationships within and outside the SAPs; assessment of the reproducibility of each system.

CONCLUSION

Proposed answers to initial questions

Results and discussion

As a first step, preliminary enquiries throughout the study-area were conducted in order to collect information on agriculture, forest management, the environment and social factors for all the villages (J.P. GARRIGUES 1990 ; G.D. DERAND 1992).

The region under study includes 28 villages, divided into three mandal panchayats: Banakulli in the north, Kudrur in the centre, west and south, Tumri to the east. The typology was made on the basis of the data for 23 villages; too many data were lacking to allow the five others to be classified.

A correspondence analysis brought out the most discriminative criteria amongst the following:

environmental

- type of vegetation
- % of village area occupied by plantations of the Forest Department and/or the Mysore Paper Mill.
- % of village area occupied by reserved forest.

agricultural

- type of crop
- % of areca-orchard owners
- proportion of male and female buffaloes in the herd
- density of cattle to village area (cow-zebu unit per ha.)

social

- house-type
- population density
- caste

In order to avoid any a priori grouping of villages according to caste, we chose to introduce this factor only after a preliminary analysis.

Results of the Correspondence Analysis

We used the software programmes "Macmul" and "Graphmu" (J. THIOULOUZE 1990, Version 4.11) on Macintosh.

Each variable includes 2 to 6 modalities. A first analysis of the 23 villages with 9 variables gave the following results (graph no. 1) :

The first axis represents 48.4% of the total variation, and the second 21.9%. The third axis, with 12%, is very close to the average (11.1%) and was discarded.

Relative contribution of the variables to the inertia explained by the axis

On axis 1, vegetation type accounts for 47% of the inertia, percentage of reserve forest for 31%, and pressure on pastures (head of cattle per hectare) 18%.

On axis 2, house type accounts for 52% of the inertia, percentage of owners of areca orchards for 23%, and population density for 11%.

Axis 1 sets the type of vegetation (forest, mosaic or grasslands) and the areas under reserved forest against a factor determined by herd-size and grazing land available in the village area. Villages are thus grouped according to type of environment. Axis 2 groups them according to agricultural type (owners of areca orchards, house-types) and population density in the village area. It can be seen that the population density is higher when the percentage of areca orchard owners increases. This is because it is possible to generate high earnings on a small plot with areca palms, while for villages where rice cultivation predominates each farmer must own, on the average, a much larger area in order to obtain equivalent earnings.

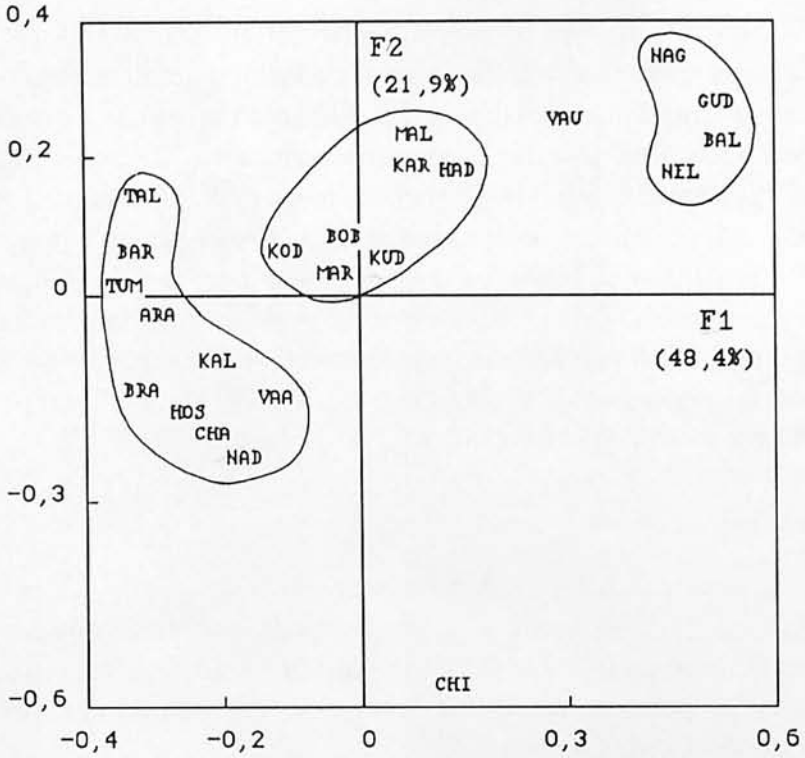
Discussion

A grouping into three larger sets was obtained:

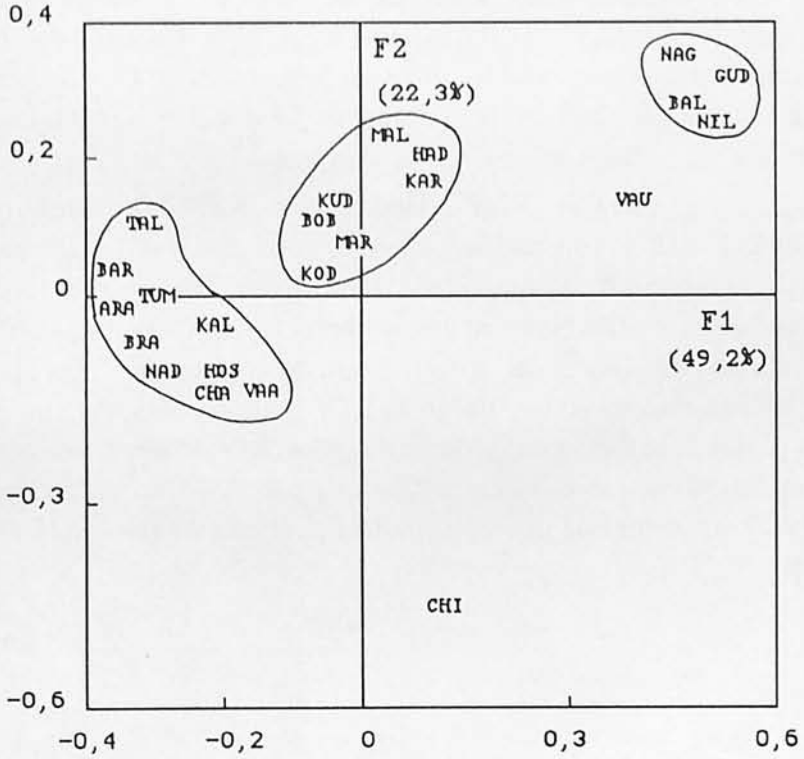
Group 1 : Nagavalli, Balige, Nelahari and Gudihitlu, four villages in reserved forest in the north-west of the study-area, inside a sanctuary. Population density is low (9-30 inhabitants per km^2 - adjusted 1981 Census figures).

Group 2 : Talagodu, Baruve, Tumri, Araballi, Kalasavalli, Brahmanakeppige, Hosahalli, Chaduravalli, Nadakeppige and Valagere, ten villages to the east of the area, in a mosaic of forest and grassland. Population density is relatively high (more than 100 inhabitants per km^2), and permanent structures indicate that a significant proportion of the inhabitants of these villages is relatively well-off.

Group 3 : Malur, Karni, Hadagalale, Kodanalli, Bobbige, Marathi and Kudrur, seven villages in the centre and south of the area, in forest-grassland mosaic and grassland, partly in reserved forest. Population density lies between that of the two previous groups (40 to 60 inhabitants per km^2), as does the house-type. In the subsequent study of agrarian systems, Valur and Chimale were added to this group. Valur does not occupy the same geographical situation as the "encroachment" group of villages (Group 1), while its social structure is very close to that of the villages in the centre of the study area (Group 2).



Graph n° 1 : Correspondence analysis of 23 villages using 9 variables



Graph n° 2 : Correspondence analysis of 23 villages using 10 variables

Chimale is situated in the north-east of the area. The house-types (houses financed by the government), the social structure and the population density are close to those of Group 3.

In the course of this analysis, we wanted to avoid bringing in the caste factor as a discriminating element from the outset.

A second correspondence analysis with 10 variables ("caste" being the extra one) made it possible to discover whether this variable confirms the results already obtained or whether its influence "upsets" the analysis (graph no. 2).

The caste factor has a relative contribution of 17% on axis 2 and its effect is to bring the villages within each of the already defined groups closer together. It thus confirms what has already been described. As a first generalisation, it can be said that Group 1 is comprised of Christians and Malabaris (a peasant caste from the Malabar area) from Kerala, Group 2 is dominated by Brahmins, and Group 3 includes Jains living side by side with Chettys or Naiks.

Many investigations into Indian rural society have revealed the importance of the caste factor in explaining agrarian systems. Numerous other variables depend on this factor : type of house, staple crop, percentage of areca orchard owners, proportion of male and female buffalos in the herd. This twofold analysis, performed both with and without it, confirmed the preponderant influence of the caste factor.

On the basis of these analyses, which enabled us to clearly identify three groups of villages, we can now apply systems analysis in order to define in detail the structure of each agrarian system.

The Brahmin agrarian system

This involves ten villages situated on the lakeside. Brahmins are in the majority, and have been settled there for several generations at least, in many cases for several centuries.

The results of our systems analysis show that these villages as a whole form an entity that functions autonomously and whose geographical limits are clearly defined.

In addition, a classification into types made it possible to group together the systems of agricultural production (SAPs) which have practices, environmental conditions, a structure, a dynamic, and especially a functioning, that are comparable (J-P. GARRIGUES

1990). Within this agrarian system, we were able to define in this way five types of SAP (table no. 2).

For a proper understanding of the agrarian system, it is necessary to include landless households in the SAPs.

Types 1 and 2 are owners of large areca plantations, or planters who are in the course of capitalisation by increasing and intensifying their cultivated area. Types 4 and 5 are rice farmers; they try to maintain self-sufficiency in garden-type crops. Type 3 is an intermediate case, of rice-farmers with small plantations.

- Types 1 and 2

All these farmers are living on holdings that were already large in their parents' and grandparents' time. They have inherited a prosperous situation. They are Brahmins, or occasionally Jains.

In a difficult environment, with a shortage of cultivable land, they have chosen to cultivate crops which have a high commercial value relative to area required.

Type 2 has achieved a more or less maximal intensification of plantation; he is a manager. His circulating capital is very large. Practically all food, for both humans and animals, is purchased, and almost all the workforce is hired labour.

Type 1 is at an earlier stage: he borrows money to invest in new plantations and to intensify existing ones. His plantations are not always well-situated and irrigation problems may arise in the dry season. He is keen to diversify, on the look-out for new opportunities (hybrid capsicum for Sandoz, citronella oil sold in Bombay ...), and concentrates on crops with a high added value.

These two types rarely have more than two children, at least one of whom pursues higher education. The line of succession seems assured.

- Type 3

A planter and rice-farmer; although he may have inherited plantations that are at least a hundred years old, he faces considerable problems of investment in intensifying and diversifying crops in his areca orchards. He is reluctant to borrow (the head of the holding is often older than 45) and restricts work on the plantations in order to avoid expense. He aims at self-sufficiency in food through rice-farming, so as to be able to reinvest the income from the arecas in his

Table n°2 : typology of SAPs in the Brahmin agrarian system

SAP TYPE	1.	2.	3.	4.	5.
RICE	nil	nil	water shortage - 1 crop annually	1 or 2 harvests per year	2 harvests every year
ARECA PLANTATION	high production level (bananas and pepper) yield 12 - 16 q / acre	maximum production (bananas, pepper, cardamom, coffee cocoa) yield 15 - 20 q / acre	areca is a secondary crop no associated crops yield < 10 q / acre	nil	nil
BREEDING	large herd (> 15 heads) oilcake in food intake	as 1	small herd (< 10 heads) lack of food for cattle	as 3	as 3
OTHER CROPS	mulberry, green pepper, coconut and citronella in case of diversification	as 1 in case of diversification	sugarcane and / or ginger	sugarcane	sugarcane
CAPITAL	large	not limiting	limiting	limiting - very small	limiting and small
LAND	0,5 - 4 acres / FWU sufficient only with intensive cultivation	6 - 25 acres / FWU not limiting	0,5 - 2 acres / FWU insufficient for investment	0,3 - 1 acre / FWU very insufficient	1 - 5 acres / FWU insufficient for investment
HIRED LABOUR	180 - 220 days / acre / year	200 - 250 d / a / y	150 d / a / y	nil	60 d / a / y
HOUSEHOLD LABOUR	nil	nil	40 à 60 %	100 %.	50 à 70 %
OUTSIDE AGRICUL-TURAL EMPLOYMENT	nil	nil	50 - 100 man- days per year	100 à 150 man-days per year	30 - 50 man-days per year
SIZE OF HOUSEHOLD *	4 - 8	4 - 8	10 - 12	10 - 15	8 - 10

* number of members living on the holding
FWU : family work unit

plantations. Serious financial difficulties may put the line of succession at risk, because the area owned is already small.

- Types 4 and 5

Although both are rice-farmers, these are two quite different categories.

Type 4 earns his living almost entirely by hiring out his labour. He owns very little land, and would like to increase his holdings but has no financial means to do so. The only possibility would be to obtain a grant of government land.

Moreover, his land is often badly situated and allows only one crop, in the rainy season. Historically, his land was owned by the government. This type has arisen in the last one or two generations, from the class of landless labourers. They belong to the low castes (scheduled castes or tribes); the family is large. This type suffers greatly from the land shortage prevalent in this malnad region. Although some animals are kept, they do not provide enough manure to maintain the fertility of the fields.

Type 5 already has a large holding. If his land is far from a water source, he uses pumps to irrigate his crops in summer.

All his land yields two crops of rice each year. However his capital is relatively small and his options are therefore limited. He would like to invest in an areca orchard, and hires himself out in order to earn extra income. Another possibility for him to invest would be first of all to increase his area under rice, and then to plant a small part of it with arecas and bananas. Here again we meet the problem of land-shortage.

Within a highly structured and hierarchical system, the ties connecting these different types are very strong, and of different kinds:

- financial: type 2 is financially dominant; he invests outside, borrows from banks and lends to landless labourers and type 4 farmers at usurious rates of interest.
- labour: with the exception of type 1, all the others work for type 2 at some time of the year; type 2 is dominant in the area, but is dependent on the other types for supplies of practically every kind (food, fodder, labour).
- social: the caste system is a powerful psychological barrier to the improvement of types 4 and 5. Some members of types 1 and 2 have real power and even a clientele among the other

types. Many Brahmins, fearing that they might lose their sources of labour-supply, use all possible means to prevent the lower castes from improving their lot (threats, intervening to block access to loans ...). Moreover, many farmers feel that starting plantations or introducing new crops must remain a prerogative of Brahmins or Jains. Thus in addition to very real financial problems, the readiness to take decisions and the force of individual initiative are restricted by unexpressed taboos.

The Jain system

Far less complex and rigid than the previous system, this one is characterised by the presence of a Jain majority on the one hand and of Naiks or Chettys on the other.

Since the vegetation is similar in both these agrarian systems, the difference between them lies essentially in their social structure and the percentage distribution of the various types of cultivation practiced.

Types 1 and 2, as defined above, hardly appear. Their place is taken by Jains, who very often have two occupations. They manage practically all the small businesses in the area. Nevertheless they are very active on their farms and always ready to try out technical innovations on their holdings. The level of intensification and capitalisation in their case is often comparable to that of the Brahmins and Jains in the preceding system. The major difference here is that this type of farmer always owns rice-fields in addition to large areca plantations.

Away from Brahmin influence, the lower castes are much readier to diversify their crops. Thus, although the biggest areca plantations belong to Jains, there are also many small plantations of a few dozen trees, whose owners have been able to break through the psychological barrier of caste.

Certain Naiks form a group of farmers not found in the Brahmin agrarian system. These are cultivators who own a large area of rice-fields on the one hand, and a small areca orchard, with varying degrees of intensification, on the other. Investment and capital are often small however, and the families are large, which leads to rapid subdivision of the holdings.

In this agrarian system, a much greater autarchy of each type can be observed, and thus less inter-type interdependence. Here the vertical hierarchy is replaced by horizontal networks of mutual aid. There are two main networks: a Jain one, which connects all the more or less distant members of one family in all the villages; and a Naik one, which seems to be founded more on affinities and geographic proximity. Landless labourers are not "attached" to one farm or another. The law of supply and demand seems to be much more operative here than in the Brahmin system.

The "encroachment" type system

Quite separate, geographically as well as socially, this system occurs in a forest zone to the north-west of our study area, on the ridge of the Ghats. This is a very new system which is still in the course of development.

It originates from the administrative division of the territory. At the beginning of this century, when Govardhangiri State Forest was made a reserve, some hamlets consisting of a few huts existed in the heart of the forest. The lands in question were administered not by the Forest Department but by the Revenue Department; so the cultivators who were there at that time were considered as the owners of the land they were cultivating. During the 1920s, malaria claimed many victims in this area, and these isolated hamlets became ghost settlements. For a long time difficulty of access discouraged any new settlers. Throughout this period, until the 1950s, the plots remained in individual ownership, and thus came under the Revenue Department.

Towards the end of the 1960s, because of land shortage in the coastal zone of Karnataka and Kerala, some new settlement took place. In spite of the creation of the "Sharavaty Valley Sanctuary" in 1972, the Forest Department remained helpless in the face of this new wave of legal "encroachment".

This movement has been gaining force over the past thirty years; more and more new arrivals are occupying an area whose limits tend to become "elastic". More than 80% of these are Christian or Malabari migrants from Kerala. Chettys and Brahmins from the coastal regions or from North Kanara district make up a little less than 20% of the migratory flow (coming usually after a decease in the family, in order to avoid subdivision of family lands).

These migrants have brought their crops with them: arecas, but also coconuts, citronella, vetiver and rubber, with sugarcane and rice when the terrain permits. These are essentially cash crops. Food is purchased, and the agricultural produce is sold in Bhatkal on the coast.

This agrarián system is very loosely structured and not yet firmly established; it can be expected to expand considerably in the near future, mainly at the expense of the forest.

Each holding is very isolated, and there is practically no movement of labour: each smallholder cultivates his own land, even the Brahmins. However a significant mutual aid network exists between the Kerala migrants in the various hamlets which make up this agrarian system.

A detailed study of the villages of Kodanalli, Araballi and Gudihitlu made it possible to analyse the various modes of use of the environment, according to the availability of resources and the social relationships within each of these agrarian systems.

HUMAN IMPACT ON THE ENVIRONMENT - APPROPRIATION OF TERRITORY BY CULTIVATORS

Legal status of the land - rights of usage

To gain a proper understanding of one of the main potential driving forces behind people's actions, it seems necessary to recall briefly the various types of land-status occurring in our study area.

Private plots

These are essentially cultivated lands. They therefore come under the Revenue Department, which collects taxes on the produce. Privately owned forests and grasslands are practically nonexistent in this area. Usage rights are detailed in the "Preservation of Trees Act" of 1976 which authorises "the removal of fallen trees or any act done for the usual or customary domestic purposes or for making agricultural implements for the bona fide use of the owner...".

Lands owned by the Forest Department

In our study area, all the lands belonging to the Forest Department have been classified as "Reserved Forests". According to the law, with a few exceptions (inherited rights, written contracts ...)

no materials may be removed from reserved forests (Karnataka Forest Act, 1963, S 20).

Within reserved forests it is strictly forbidden to:
- cut large trees
- set fires
- graze cattle
- remove the bark or leaves of trees
- remove any forest product "for the purpose of manufacturing handicrafts".
- grow crops

Two reserved forests fall entirely within our study area: Karni (4534 ha.) and Kudarur (1854 ha.); and three others fall partly within it: Chennagonda (2354 ha.), Govardhangiri (13,315 ha.) and Kodachadri (3400 ha.).

Because of the presence of many villages, certain usage rights were officially recognised at the end of the 19th century in each of these reserved forests, and are still in force today.

In **Chennagonda** forest, villagers are allowed to:
- graze their cattle "on the outskirts" of the villages
- cut grass and collect dead wood
- remove leaves from shrubs for use as green manure
- use thorny plants for fences

In **Govardhangiri** forest (Gudihitlu village):
- "the villages of Gudihitlu, Balagi, Nelleri, Nagavalli and Banakulli are entitled to get prescribed quantities of cane, Balagi wood and Dadasalu.
- for Jatia in Bheemeshwara temple at Gudihitlu village, big bamboos in prescribed quantities."

In **Karni** forest:
"(for Kattinkar and Karni villages)
- free grazing
- jungle wood for agricultural implements, fuel for domestic and areca and jaggery purposes, Karada grass for thatching, rattan and junglewood poles for construction of cattle sheds and houses. Dadasalu leaves for making brooms are allowed in specified quantities on free permits".

In **Kudarur** forest:

- "free grazing, fuel for domestic use and for areca and jaggari boiling; junglewood poles and maragalas for construction of sheds and dwelling houses, timber for making agricultural implements..."

For **Kodachadri** forest there seem to be no rights of usage.

The general laws are thus mitigated near to villages where specific usage rights have been officially recognised by the Forest Department (WORKING PLAN 1977). However, vagueness about the areas involved leaves full latitude to the cultivators to abuse their rights and to forest staff to misuse their powers.

"Revenue Lands"

These belong to the Revenue Department and bear different types of vegetation: grasslands with *Phoenix humilis*, shrubby or treed grasslands, and also forest, mainly in the north-east of our study area (Araballi forests for instance).

In forests belonging to the Revenue Department, restrictions are in theory the same as in the reserved forests. In practice these forests are much less thoroughly supervised, and on the spot it can be seen that they are disappearing much more rapidly. This raises one of the major problems of this region: the division of ownership between the Forest Department and the Revenue Department, and their different modes of management. On the one hand some grasslands are labelled "reserved forest", and on the other some forests are managed by the Revenue Department. This confusion is exploited by all who are making illegal and abusive misuse of the forests in the area.

Benalands and Bettalands

Although the term "soppinabetta" (literally "place where one can collect green manure") appears in official texts in North Kanara District from the end of the last century onwards to designate certain private forests subject to specific rights of usage (GADGIL 1988), it is never mentioned in Shimoga District. This difference originates from the colonial management of the lands. North Kanara lay under direct British control, and areas of forest which were used as a source of green manure were officially classified as "bettalands". This signified that owners of areca orchards retained their rights of usage over the forest, and therefore the usufruct of it (NADKARNI 1989).

In Shimoga District it seems that these practices, which also existed in our area during the last century, were never officially recognised. We can suggest several hypotheses to explain this situation:

- Shimoga District has much less tree cover than North Kanara, and the forested area was proportionally much less; the problem therefore arose less frequently;
- under the rule of the princely state of Mysore there was less British pressure on Shimoga District at the end of the 19th century; a precise subdivision of forest lands for agricultural use was therefore not so strictly carried out as in North Kanara District.

Besides, in our study area, the term "bettaland" is used in a very wide sense. It refers to any area of forest appropriated de facto by a single individual (the official owner is usually the Revenue Department). This area is used not only as a source of green manure but also supplies forest litter, firewood, occasionally timber, ligneous fodder, and young stems for fences.

The "benalands" resemble "bettalands" but refer to grazing land ("bena" means grassland in Kannada). As in the case of the "bettalands", the term "benaland" carries a strong connotation of appropriation. A benaland is used by a single individual who is usually not the official owner (usually on lands belonging to the Revenue Department but also occasionally to the Forest Department).

In order to maintain individual usage, the area is systematically protected (by a thorny hedge reinforced by a ditch). The benaland provides grazing exclusively for the cattle of the user. It is a source of fodder to the extent that the protection enables the grass to grow better than elsewhere. In some cases the user plants useful woody species (*Anacardium occidentale*, *Careya arborea*, *Tectona grandis*...).

Comparative study of management of the environment in three selected villages

Gudihitlu, forest village of the "encroachment" type

This village is representative of the "encroachment" type of agrarian system. Dwellings are widely dispersed and there is no shortage of resources (forest biomass). In these conditions, with the absence of any competition for use of the forest, we cannot really speak of the "appropriation" of areas of forest.

Because of the origin of the population here, the term "bettaland" is not in use. The abundant availability of biomass seems to lead to an absence of management of the resources, which appear inexhaustible. The forest is thus considered as a "horn of plenty", and removals are most often made with the aim of gradually reducing the forest in order to be able to increase the cultivated area (figure no. 1). Difficulty of access hampers surveillance of these settlements by forest staff, and the pressure of incoming migrants leads to an increase in the cleared area.

A check on removals made by a representative section of cultivators in the village enabled us to assess how the environment is utilised.

No system of rotation is observed in the areas from which firewood and timber as well as green manure and ligneous fodder are removed. In addition, on the edge of the forest, many trees are regularly lopped (lower branches and crowns) to let in light and permit the growth of herbage beneath them. This is because, in the absence of open grasslands, the peasants have a problem in feeding their animals. These are not allowed to graze freely but are kept tethered, either in enclosures or on stakes amid patches of herbaceous growth created in this way under the trees or on the edges of cultivated plots.

So in this village we can observe a double transfer :

- a transfer of fertility from the forest to the cultivated areas
- a transfer of forested land towards grassland or agricultural plots.

Kodanalli: grassland with patches of forest

Situated in the centre of our study area, the territory of this village is comprised of 75% grassland and 25% forest, confined mainly to the south-west part.

Representative of the Jain agrarian system, Kodanalli exhibits different modes of appropriation of territory (grassland and forest). This leads to a range of different degrees of management of the environment.

- "Open access" forests and grassland

In this case, we again find the same absence of resource management as in Gudihitlu. The environment belongs to everyone, Figure n° 1 : Clearance in the village of Gudihitlu

■ Forest

☐ crops (year n)

▨ crops and / or grassland (year n+1)

▨ crops and / or grassland (year n+2)

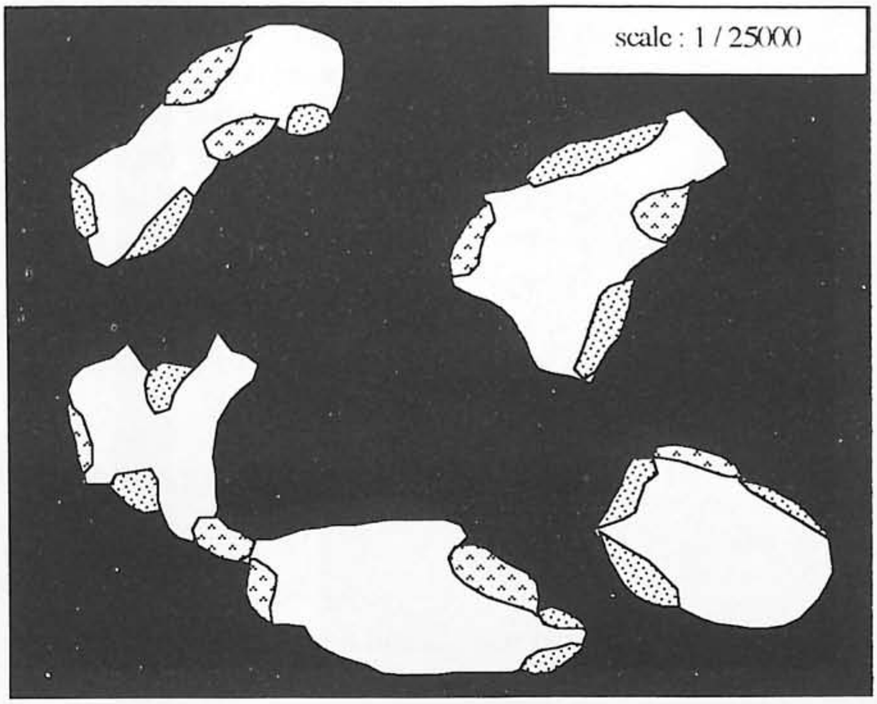
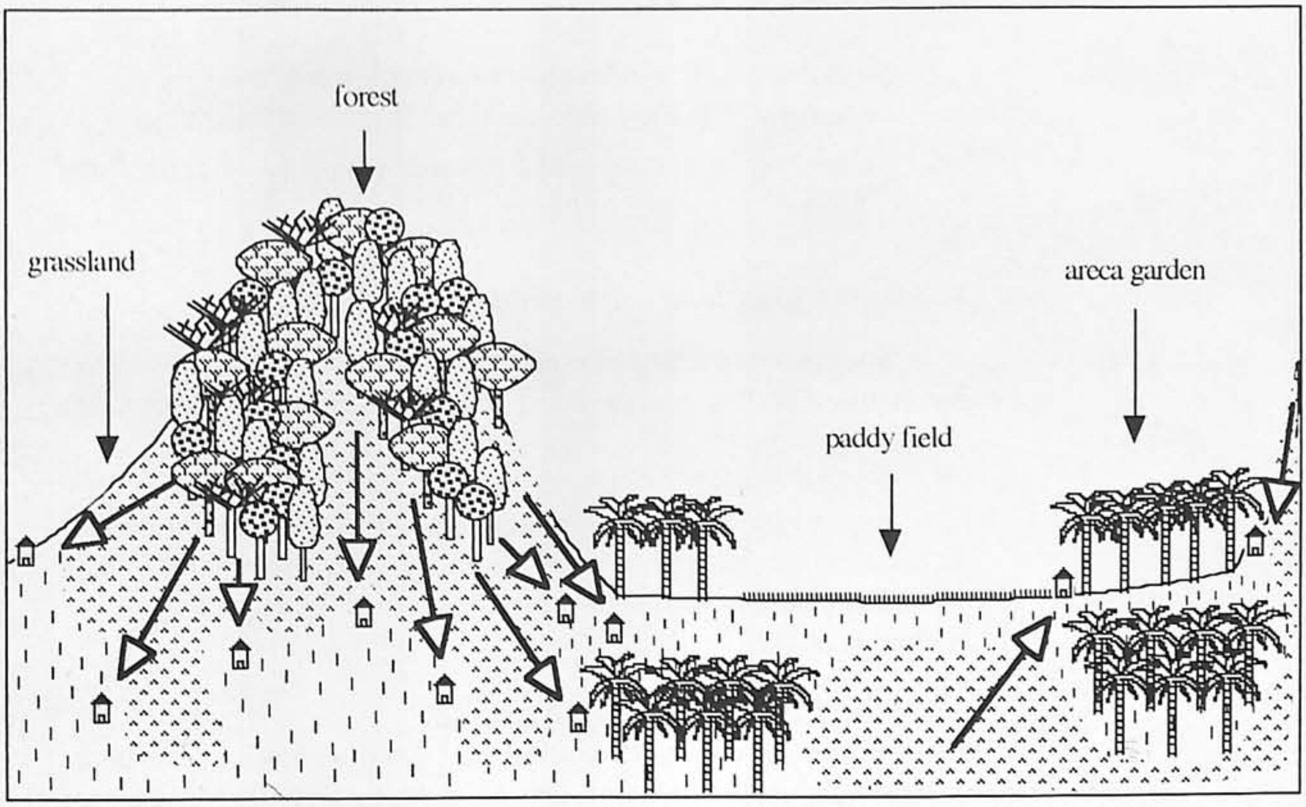


Figure n° 2 : Use of resources in the village of Kodanalli - "Locally restricted" access - proximity phenomena

→ : biomass flow



and therefore to no one. On the spot it can be seen that this kind of relationship to the environment occurs when the local population density is low and there is therefore no competition for use of the resources.

No rotation is practiced, bushes and shrubs are cut flush to the ground, and the grass is always cropped bare because it is grazed constantly all year round.

The forests in question belong almost entirely to the Revenue Department (only 5% of the area of this village falls within a reserved forest).

- Grasslands and forests with locally restricted access

The expression "locally restricted" refers to a form of agreement among the peasants to distribute resources. By tacit accord, each recognises the limits of the areas from which they can remove materials.

Here we can begin to see some competition for access to resources : population density is greater, and near to the dwellings there is a lack of forest or grassland. Two solutions are possible:

- to continue "open access" removals, which can only lead to rapid exhaustion of the resources
- to limit the number of households making removals from each type of vegetation

This second option has been chosen by the great majority of cultivators in Kodanalli. The number of authorised collectors in a given area depends essentially on the number of houses nearby. On the spot we counted up to ten families authorised to collect on the same hill (figure no. 2). This situation is extremely interesting because when the number of collectors is restricted in this way a very clear phenomenon of mental appropriation of resources can be observed to emerge, leading to a rational management of the environment.

Let us take two extreme cases: when ten families are making use of the same area, management of the resources is hardly different from that encountered at Gudihitlu; when two families share an area of forest and grassland on one hillside, controlled trimming for firewood and green manure appears; wood is cut, the leaves collected and the branches left lying to be used for firewood the following year; rotation is also practiced, so that the trees are given time to grow new branches;

shrubby and treed grasslands are used more than the forest, which is considered as a reserve for timber and litter.

- A single user of the resources: benalands and bettalands

This is the final stage of appropriation. In Kodanalli this phenomenon is very widespread and seems independent of caste (Jains, Naiks and Chettys all have benalands and bettalands). An excellent management of resources is to be observed in both bena and bettalands (figure no.3).

The lands are totally protected (by a thorny hedge reinforced with a ditch). The benalands supply fodder, green manure (*Careya arborea*, *Terminalia tomentosa*, *Terminalia paniculata*...) and firewood (small branches), and *Phoenix humilis* leaves are used for making mats. Systematic lopping is practiced (two or three apex branches are left on each tree or shrub). In some cases, the user plants useful woody species on his plot: *Anacardium occidentale* for its fruits, *Tectona grandis* for timber, *Careya arborea* for fodder and green manure, *Vitex negundo* as an insecticide and repellent.

As a result, the management of the benalands makes it possible to conserve or increase the vegetation cover. Grazing is limited and field observations have shown that herbaceous cover is far better on benalands than on open-access grasslands.

As for the bettalands, they are seen by their users as an insurance, a reserve in case of need. This means that removals are essentially restricted to leaf litter and fallen deadwood. Timber is taken from "open access" forest areas. It may thus be considered that the bettalands are used in moderation because other sources of supply are available. How would they be managed if there were no forests round about? For the moment this question remains unanswered.

Araballi: forest-grassland mosaic

Araballi includes all types of vegetation: evergreen forest, semi-deciduous forest, wet deciduous forest, groves and clumps of bamboo, shrubby and treed grasslands, grasslands with *Gardenia resinifera*.

In Araballi, which is very typical of the Brahmin agrarian system, appropriation of territory is closely connected with the caste system.

It is a small village with a population density that is higher than the average for the region. There are no open-access forests or grasslands. All removals outside bena and bettalands are locally

Figure n° 3 : Benaland and Bettaland in Kodanalli

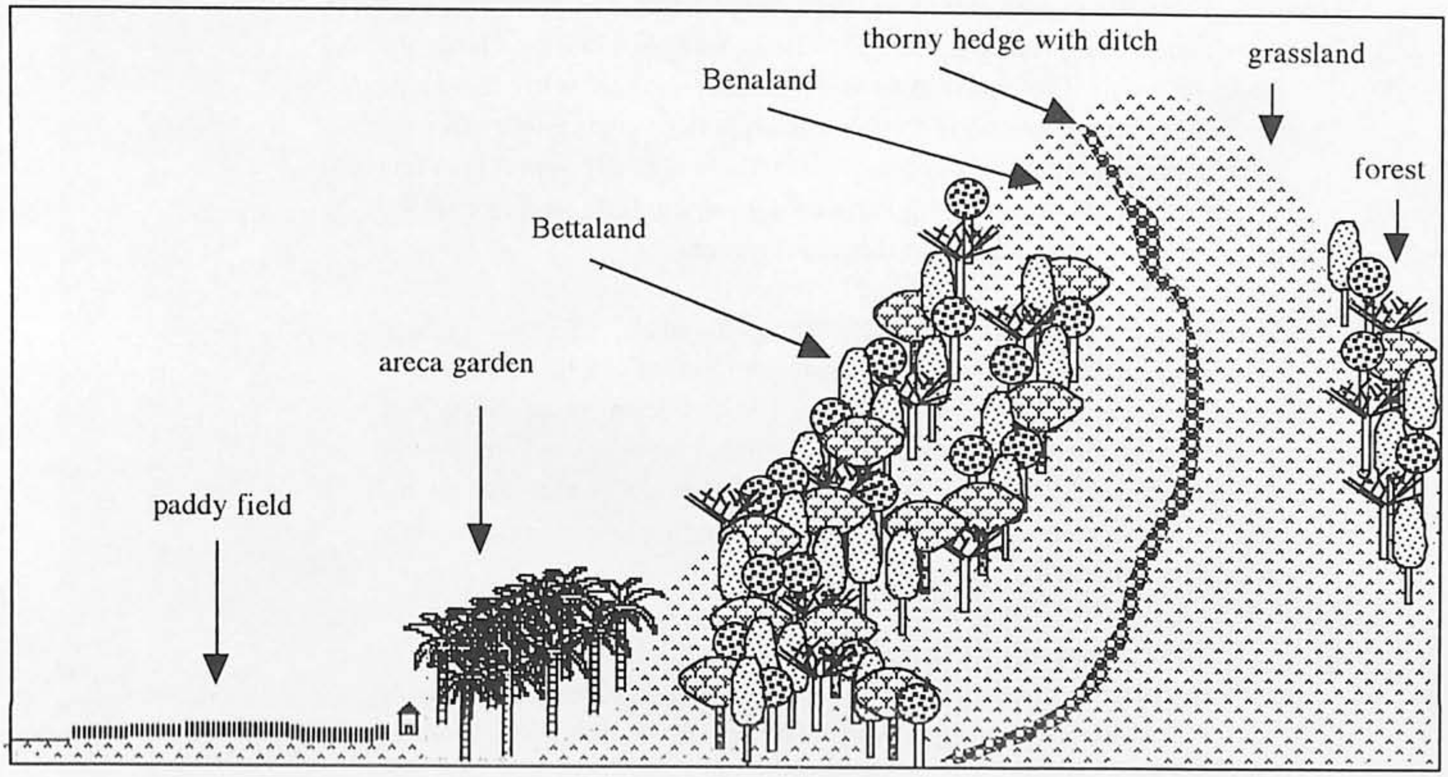
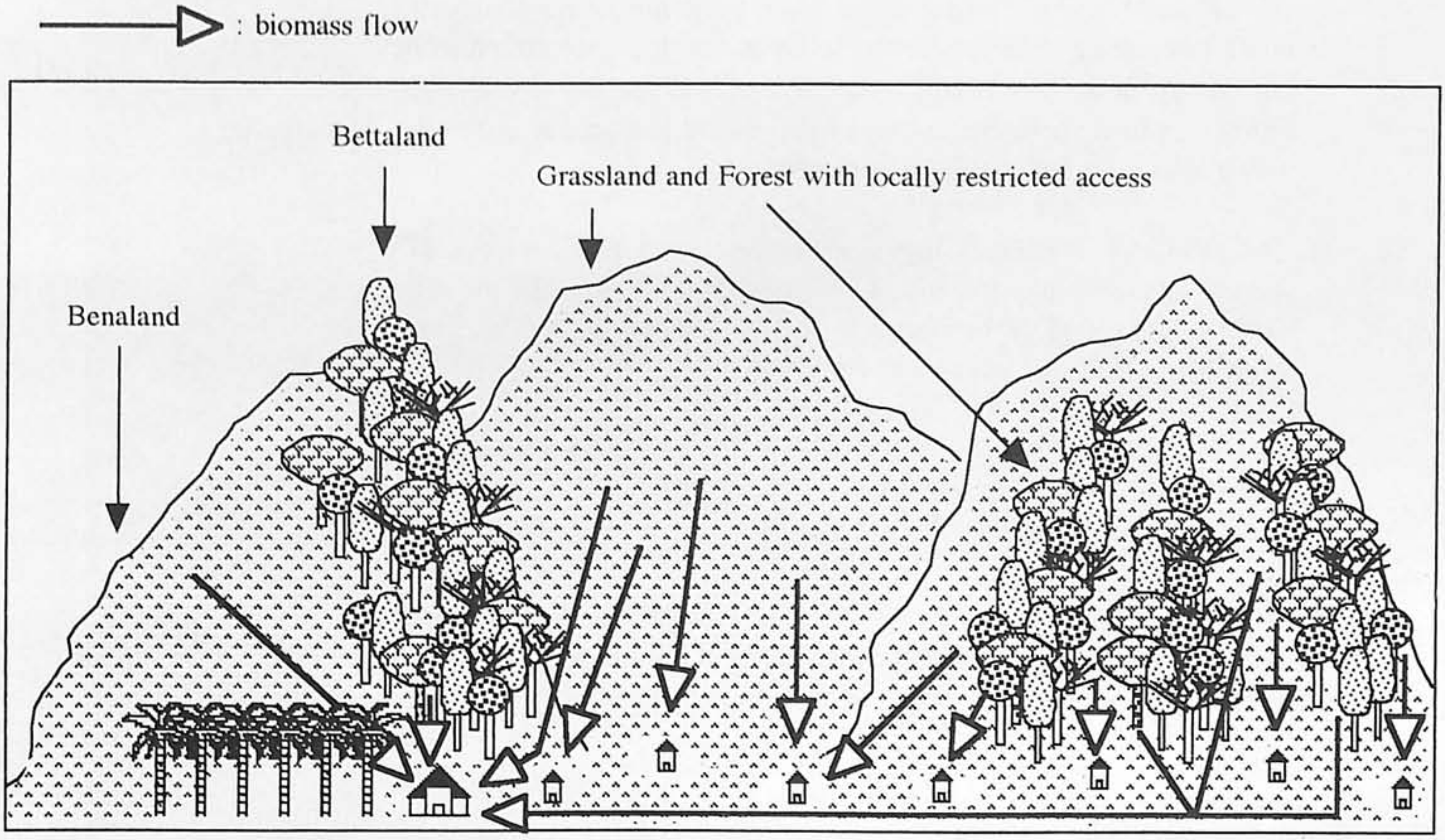


Figure n° 5 : Use of resources in Araballi



restricted. We identified two to nine families authorised to make removals from grassland or forest. These were mainly low-caste.

The sole owners and users of the large benalands and bettalands (sometimes comprising an entire hillside) are Brahmins. Here, the mode of using the environment is closely linked with the caste hierarchy. It is an insidious system which at first sight might give the impression that the management of a bettaland is better than it is in fact (GADGIL 1991). But sociological and agronomic field studies enabled us to clarify various aspects of this management.

Even more than in Kodanalli, the bettalands here seem to present a model of good management : rotation for removals of litter, firewood, green manure and ligneous fodder; limited lopping of branches, systematic trimming.... However, a complex network of employees (figure no.4) enables each Brahmin to collect the major part of his biomass requirements from the whole surrounding vegetation, not only on village territory but even outside it.

Thus the labour force gathers occasionally from the benalands and bettalands, but mainly from its normal collection areas. This means that the "locally restricted" areas benefit not only the low-caste families who live nearby, but also the Brahmins who employ these families (figure no.5). So again we can ask: how would the bettalands be managed in the absence of this outside source of biomass?

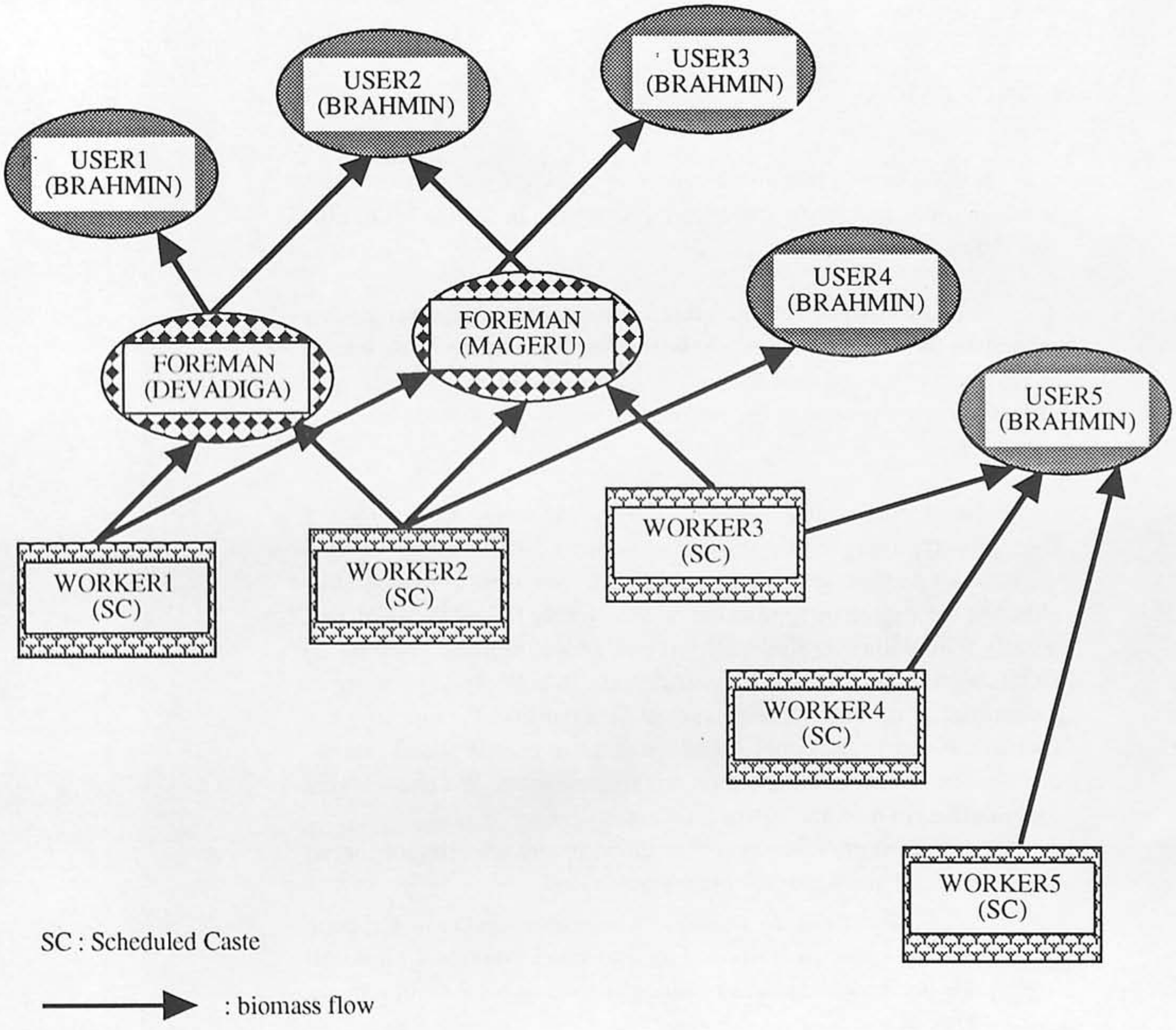
Since they can afford to do so, some Brahmins do not hesitate to hire a lorry and a team of workers to go and collect green manure 20 kms. away, in another village on the lakeside. These massive fertility transfers, which are in the course of being quantified, greatly distort the way in which the bettalands are managed.

As for the benalands, they are considered as a fodder reserve. No woody species is planted and herbaceous production is the priority. There is no hope of the benalands in Araballi becoming small orchards in the medium term, as there is at Kodanalli.

In Araballi it could be observed that the low castes are suffering severe grazing shortages, for two reasons:

- the Brahmins' benalands are very large, sometimes covering entire hillsides.
- in the grasslands of neighbouring villages the Mysore Paper Mill has established large plantations of a single species, *Acacia auriculiformis*.

Figure n° 4 : Network of collectors and users in the village of Araballi



As a result, on some parts of locally restricted hillsides with treed grasslands the users have rased all woody species, dug a ditch and erected fences, in order to increase herbaceous growth. Here one could speak of a "collective benaland". This was observed on a hill lying between the villages of Araballi and Chuttikare.

The case of Araballi is typical of the Brahmin agrarian system: one caste appropriates resources, and the resulting shortage leads the other castes to seek solutions to the extent that they can organise themselves.

CONCLUSION

In the course of this investigation we worked on several different levels in order to analyse the differing practices occurring within the study area.

Systems analysis revealed three quite distinct agrarian systems related to the aspects which we wished to investigate: the type of environment (natural and artificial), the forms of appropriation of village territory practiced by cultivators, and the modes of usage of resources.

The detailed study of three villages (Araballi, Kodanalli and Gudihitlu) typifying the three agrarian systems, led us to discuss what might be termed "the impulse to appropriate". We were able to see that although the degree of appropriation was closely linked to population density (Gudihitlu and Kodanalli), it could also originate from social factors such as the caste hierarchy (Araballi). In both cases (presence of a dominant caste and increase in population density) the outcome is a shortage of resources, either for all, or only for certain social classes, and thus an increased competition among collectors. We encountered two solutions in response to this problem:

- a physical modification of the environment (clearing of forests or treed grasslands to obtain grazing land)
- a property division: a hillside where the vegetation has been used in common is divided up into small individual plots. All the intermediate stages resulting from reciprocal compromises appear.

This study also showed the influence of the official status of the land on removals made from it. Reserved forests, because of their status and the surveillance of forest staff, are rarely appropriated either by a group or an individual. But this surveillance does not prevent them being used by everyone; as discreetly as possible, but without any reasoned management.

The legal status of the land therefore does not affect the presence or absence of removals; but it does affect usage practices.

Distance from the resources (at Kodanalli and Gudihitlu) and the degree of appropriation determine the type of removals practiced. In other words, it seems illusory to try to maintain a reserved forest when there are villages nearby, especially if these are right in the midst of the forest itself (as Gudihitlu is). Forests can be protected by the Forest Department only when they are far away from any dwellings.

In the Brahmin agrarian system, the proximity factor is no longer applicable, because the large labour network available to the Brahmins enables them to use collection sites all over the village area and sometimes even beyond it.

It is obvious that the quality of the management of the resources depends on the number of people using the biomass in a given area. Although it can be said that management improves when the number of users diminishes, it would be a premature oversimplification to consider benalands and bettalands as a miracle cure for unregulated human exploitation of the environment. Indeed, how can we speak about good management of bettalands when most material is collected outside them (even when their area corresponds to the recommended norm of 7-9 acres of bettaland per acre of areca orchard) ?

The historical study showed that agricultural practices alone cannot account for the present condition of the vegetation in this area; but the example of the "encroachment" type of agrarian system indicates that they do have some effect on it.

Although appropriation may lead to a greater awareness that resources have limits, this awareness applies only to the area appropriated: the "outside" continues to be treated as an inexhaustible source of supply.

From the point of view of the agrarian systems practiced in our study area, it can be seen that the phenomenon of appropriation of territory has an effect that is generally positive when the population as a whole, including all social classes, is involved in it. If, on the other hand, one class exercises a monopoly on private property (as in the Brahmin agrarian system), the effect on the vegetation in locally restricted or open access areas is extremely negative.

BIBLIOGRAPHY

BUCHY M.
1990 "Colonial forest exploitation in the Western Ghats of India : A case study of North Kanara District", *Pondy Papers in Social Sciences*, n° 7, Pondicherry.

BEDU L., MARTIN C., KNEPFLER M., TALLEC M., URBINO A.
1987 "Appui pédagogique à l'analyse du milieu rural dans une perspective de développement", *Documents systèmes agraires*, n° 8, CIRAD, Montpellier.

BUCHANAN F.
1807 *A journey from Madras through the countries of Mysore, Canara and Malabar*, London, 3 vols.

DAS B. K.
1981 *Census of India*, series n° 9, *Karnataka State*, part XIII-A & B, *District Census Handbook, Shimoga District*.

DERAND G.D.
1992 *Une région des malnads, Karnataka, Inde du sud. Etude de l'action anthropique sur les formations végétales*, Mémoire ESAT 1, CNEARC, Montpellier.

GADGIL M., SUBASH CHANDRAN M. D.
1988 "On the history of Uttara Kannada forests", in J. DARGAVEL et al. (eds.), *Changing tropical forest*, Canberra.

GADGIL M.
1991 "Ecological organization of the Indian society", *ICSSR Newsletter*, XXI (4).

GARRIGUES J.P.	
1990	*Une région des malnads, Karnataka, Inde du sud. Etude des systèmes de production agricole - Rôle de la forêt dans le fonctionnement des exploitations*, Mémoire ESAT 1, CNEARC, Montpellier.
JOUVE Ph.	
1984	"Le diagnostic agronomique, préalable aux opérations de recherche - développement", *Les Cahiers de la Recherche-Développement,* n° 3 & 4, CIRAD, Montpellier.
JOUVE Ph.	
1988	"Quelques réflexions sur la spécificité et l'identification des systèmes agraires", *Les Cahiers de la Recherche - Développement*, n° 20, CIRAD, Montpellier.
NADKARNI M. V.	
1989	*The political economy of forest use and management,* New Delhi.
PASCAL J.P.	
1984	*Les forêts denses humides sempervirentes des Ghâts occidentaux de l'Inde*, Pondicherry, Institut Français.
PASCAL J.P., SUNDER S., MEHER-HOMJI V.M.	
1982	*Forest map of India, Shimoga*, Pondicherry, Institut Français.
POUCHEPADASS J.	
1990	"The ecological history of the Central Western Ghats in the modern period : A preliminary survey", *Pondy Papers in Social Sciences,* n° 6, Pondicherry, French Institute.
STEBBING E.P.	
1922-26	*The forests of India*, London, 3 vols.

SUBBAIAH P.S.

1987 *Karnataka Forest Act, 1963. Preservation of Trees Act, 1976. Karnataka Wild Life Protection Act, 1972 (with notes and case laws)*, Bangalore.

VEERAPPA N.G., ADKOLI N. S.

1977 *Working Plan Report for Sagar Forest Division*, Bangalore.

Institut Français de Pondichéry. Département de Sciences Sociales

Etude des modalités de l'action anthropique sur la végétation par l'analyse des systèmes agraires (Ghâts occidentaux, District de Shimoga, Taluk de Sagar)

Située dans le district de Shimoga, entre les Ghâts occidentaux et le lac de Linganamakki, la région d'étude est recouverte d'une mosaïque de forêt sempervirente, forêt semi - décidue, pâturages et terres cultivées.

Au 19ème siècle, cette région, difficile d'accès, fut très peu exploitée par le département des forêts. Mais pendant la première moitié du 20ème siècle, la construction de deux barrages hydroélectriques aboutit à une destruction massive des zones forestières.

Actuellement, l'action humaine se résume aux prélèvements (bois de feu, bois d'oeuvre, engrais vert, litière forestière, fourrage, poteaux de clôture ...) effectués par la population sur l'ensemble de la végétation et aux plantations du département des forêts et des papeteries d'Etat sur les pâturages. Dans les trois systèmes agraires que nous avons identifiés, les formes de l'action anthropique dépendent du degré d'appropriation de l'espace. Cette appropriation est elle-même dépendante de la densité de population et de la structure sociale des villages.

Les Bettalands, parcelles de forêt privée que la littérature décrit comme un des meilleurs exemples de gestion de l'environnement, sont censés être la source de la majeure partie de la fertilité nécessaire aux jardins d'aréquiers. En fait, ces terres sont sous le contrôle d'agriculteurs influents et le gigantesque flux de fertilité utilisé par les terres cultivées provient de l'ensemble de la végétation à l'exception des Bettalands; en dehors du système, ces derniers ne remplissent pas leur rôle de réservoir d'engrais vert.

Mots-clés : Inde, Karnataka, Ghâts occidentaux, Forêts, Systèmes agraires, Action anthropique, Betta land

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Anthropic action on the vegetation in the Western Ghats of India (Shimoga District, Karnataka): A study using agrarian systems analysis, Pondy Papers in Social Sciences, n°12, Pondichéry, 1993, 36 p.

PONDY PAPERS IN SOCIAL SCIENCES

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